

State of Hawaii  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
Division of Aquatic Resources  
Honolulu, Hawaii 96813

June 9, 2006

Board of Land and  
Natural Resources  
Honolulu, Hawaii

REQUEST FOR AUTHORIZATION/APPROVAL TO ISSUE ONE (1) NORTHWESTERN  
HAWAIIAN ISLANDS (NWHI) RESEARCH, MONITORING AND EDUCATION PERMIT  
TO DR. LESZEK KARCMARSKI OF TEXAS A&M UNIVERSITY AT GALVESTON  
FOR ACOUSTIC SAMPLING, GENETIC SAMPLING, AND INDIVIDUAL PHOTO-  
IDENTIFICATION OF SPINNER DOLPHINS WITHIN KURE ATOLL LAGOON,  
VALID FROM JULY 1, 2006 TO OCTOBER 31, 2006

Submitted herewith for your authorization and approval is a request for issuance of a NWHI Access Permit to Dr. Leszek Karczmarski, Associate Research Professor of Marine Biology at Texas A&M University. The Research, Monitoring and Education Permit, described below, will allow activity to occur in the NWHI State marine Refuge (0-3 miles) waters surrounding Kure Atoll. The activities covered under this permit will occur from July 1, 2006 to October 31, 2006, from Kure Atoll.

The goal of this project is to provide baseline data on population size, inter-island movement patterns, residence rate, genetic stock structure, genetic diversity, social structure, behavioral patterns, and habitat use patterns of Hawaiian spinner dolphin. This long-term data set will aid the State in management by helping to identify current or potential threats to the population; for instance, unusual mortality events caused by disease outbreaks would go unnoticed if baseline information on population structure and ecology is not known. Furthermore, documenting daily behavioral patterns and preferred habitat usage within the lagoon at Kure Atoll helps managers to identify "off limits areas" for small boats working within the atoll, and this information may be extrapolated for application in many other similar atoll locations in NWHI.

The proposed activities (below) are consistent with and support the purposes of the Refuge, primarily to better understand and manage the resources within the marine refuge.

The researchers propose to conduct photo-identification surveys from a small outboard boat, following standard boat-survey protocols. They propose to conduct genetic sampling via non-lethal biopsy (see permit application for extensive details). This methodology has not been shown to have deleterious behavioral effects on dolphins, and the International Whaling Commission has concluded that any short-term or long-term negative effects of biopsy darting are unlikely. Finally, the researchers propose to conduct acoustic sampling and monitoring via a stationary hydrophone array.

REVIEW PROCESS:

The permit was received by the Division of Aquatic Resources on April 17, 2006. It was sent out for review and comment to the following scientific entities: Division of Aquatic Resources staff (5), Division of Forestry and Wildlife, Northwest Hawaiian Islands Coral Reef Ecosystem Reserve, United States Fish and Wildlife Service. Native Hawaiians from the Office of Hawaiian Affairs, and Kaho'olawe Island Reserve Commission were also consulted.

As of May 30, 2006, comments received from the Scientific Community are summarized as follows:

The applicant was asked to clarify how they would ensure that dolphins would not be sampled more than once.

In addition, the Division of Aquatic Resources received the following comments from the Northwest Hawaiian Islands Coral Reef Ecosystem Reserve, which supports this application and the issuance of permit with the following conditions:

- 1) Define locations and length of time each acoustic array will be deployed.
- 2) Documentation of behavior of animals following biopsy or acoustic sampling.
- 3) Mode of attachment must not pose an entanglement hazard to marine life.
- 4) Approval contingent upon applicant obtaining permits from the National Marine Fisheries Service.

The Reserve also requests clarification on one particular issue and specifically recommends that applicants should be provided with a briefing on the Native Hawaiian cultural significance of the area, and that discharge must be regulated in accordance with Reserve prohibitions when transiting Reserve waters. See Attachment 1 for detail of the Reserve's comments.

No comments were received from the agencies representing Native Hawaiians.

#### RESPONSE:

Samples will be collected only from individually recognizable members of the spinner dolphin population at Kure Atoll, which ensures that no individual will be sampled twice as all of them possess individually recognizable markings. The intention is to sample each known (individually recognizable) dolphin in the population, and based on their current photo-ID catalogue (and assuming that since our last year field season a few more individuals might have acquired distinctive markings), they anticipate the total number of samples not to exceed 100 (in other words at the most 100 samples).

#### FINAL STAFF RECOMMENDATIONS:

- 1) Approve the request for non-lethal biopsy of up to 100 spinner dolphins in Kure Atoll lagoon;
- 2) Approve the request for permission to photograph spinner dolphins in Kure Atoll lagoon;

- 3) Approve the request to conduct acoustic monitoring studies, based on additional permit conditions recommended by the Reserve.

RECOMMENDATION:

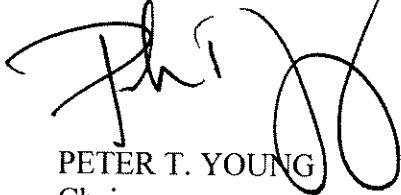
"That the Board authorize and approve, with stated conditions, a Research, Monitoring and Education Permit to Dr. Leszek Karczmarski of Texas A&M University, for activities and access within the State waters of the NWHI."

Respectfully submitted,



DAN POLHEMUS  
Administrator

APPROVED FOR SUBMITTAL



PETER T. YOUNG  
Chairperson

**Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve**  
**NOAA/NOS/NMSP**  
Comments on State of Hawaii NWHI Marine Refuge Permits

**PERMIT SUMMARY**

**Title:** Population Ecology of Spinner Dolphins in Far-Western Hawaii: Long-Term Monitoring Program

**Project Leader:** Leszek Karczmarski

**Location:** Kure Atoll

**Description:** Individual Photo-Identification, Genetic Sampling, and Acoustic sampling

**BACKGROUND**

Research on spinner dolphins is providing new insight into spatial distribution of species throughout the Hawaiian archipelago. Baseline data on population size, inter-island movement patterns, residence rate, genetic stock structure, genetic diversity, social structure, pattern of behavior, and habitat use patterns has revealed that spinner dolphins in the NWHI differ from those in the main Hawaiian Islands. A significant amount of data has been collected from the spinner dolphin in the main Hawaiian Islands and additional samples need to be collected from the NWHI to confirm the preliminary evidence that the NWHI population is genetically distinct throughout the Hawaiian Island chain.

**MANAGEMENT RELEVANCE TO THE RESERVE**

The Reserve is fundamentally interested in understanding the degree of connectivity between marine populations found in the main Hawaiian Islands and the NWHI. From a management perspective, it is important to discern if spinner dolphin populations are distinct management units or interactive interbreeding stocks.

**POTENTIAL IMPACTS**

The activities under consideration include setting up an acoustic hydrophone array at a location at Kure Atoll frequently used by spinner dolphins for resting. The Reserve strongly recommends that further monitoring be conducted on the animals sampled for biopsy or acoustic sampling to ensure that any impact does not result in behavioral changes or apparent health.

**RESERVE RECOMMENDATION**

The Reserve supports this research project and recommends conditionally issuing the permit as requested with additional information clarified (see conditions below).

**Need further clarification on:** It is unclear as to how the acoustic buoys will be deployed (tethered to a float or secured to the benthos) and for what length of time. If lines are to be used in deployment, entanglement hazards to marine life should be evaluated. Restrictions should be placed on the location and length of time the acoustic arrays can be deployed.

It is unclear how researchers and gear will be transported to Kure. If access is via vessel then section 21 of the permit application must be completed, and discharge must be regulated in accordance with Reserve prohibitions when transiting Reserve waters.

It is unclear when this project will be completed. Project completion date not specified in section 17. Section 8c also must be completed.

**Specific Recommendations:**

- Applicants should be provided with a briefing on the Native Hawaiian cultural significance of the area.
- Discharge must be regulated in accordance with Reserve prohibitions when transiting Reserve waters.

**Conditions:**

1. Define locations and length of time each acoustic array will be deployed.
2. Documentation of behavior of animals following biopsy or acoustic sampling.
3. Mode of attachment must not pose an entanglement hazard to marine life.
4. Approval contingent upon applicant obtaining permits from the National Marine Fisheries Service.

☐ Approve

☒ Approve with conditions

☐ Disapprove

Reserve staff Reviewers:

☒ Malia Chow, Ph.D.

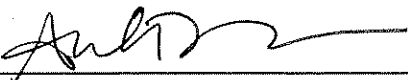
☒ Randy Kosaki, Ph.D.

☒ Moani Pai

☒ Kekuewa Kikiloi

☒ Hoku Johnson

Manager's concurrence with staff recommendation



Aulani Wilhelm, Acting Reserve Manager

## APPENDIX 1

**State of Hawai'i  
DLNR  
Northwestern Hawaiian Islands State Marine  
Refuge  
Permit Application Form  
Draft**

<i>For Office Use Only</i>
Permit No:
Expiration date:
Date Appl. Received:
Appl. Fee received:
NWHI Permit Review Committee date:
Board Hearing date:
Post to web date:

### Type of Permit

- ☒ I am applying for a **Research, Monitoring & Education** permit. (Complete and mail Application)
- ☐ This application is for a NEW project in the State Marine Refuge.
- ☒ This application is for an ANNUAL RENEWAL of a previously permitted project in the State Marine Refuge.
- ☐ I am applying for a permit for a **Native Hawaiian** permit. (Complete and mail Application)
- ☐ This application is for a NEW project in the State Marine Refuge.
- ☐ This application is for an ANNUAL RENEWAL of a previously permitted project in the State Marine Refuge.
- ☐ I am applying for a **Special Activity** permit. (Complete and mail Application)
- ☐ This application is for a NEW project in the State Marine Refuge.
- ☐ This application is for an ANNUAL RENEWAL of a previously permitted project in the State Marine Refuge.

Briefly describe **Special** permit activity:

When will the NWHI activity take place?

- ☒ **Summer** (May-July) of 2006

Note: Permit request must be received before February 1st  
Specific dates of expedition depart May 8

- ☒ **Fall** (August-November) of 2006

Note: Permit request must be received before May 1<sup>st</sup>  
Specific dates of expedition Return September 2006

- ☐ **Other**

**NOTE: INCOMPLETE APPLICATIONS WILL NOT BE ACCEPTED**

**Please Send Permit Applications to:**

NWHI State Marine Refuge Permit Coordinator  
State of Hawai'i  
Department of Land and Natural Resources  
Division of Aquatic Resources  
1151 Punchbowl Street, Room 330  
Honolulu, Hawai'i 96813

*NWHI State Marine Refuge Permit Application*

**NWHI State Marine Refuge Permit Application**  
**See Appendix 2 for Application Instructions**

<b>Section A – Applicant Information</b>	
1. Project Leader (attach Project Leader's CV or resume) <input checked="" type="checkbox"/> CV attached  Karczmarski, Leszek Name: Last, First, Middle Initial	Dr., Associate Research Professor Title
2. Mailing Address (Street/PO Box, City, State, Zip)  Institute of Marine Life Sciences Texas A&M University 4700 Avenue U, Bldg. 303 Galveston, TX 77551	Telephone (409) 740-4718 Fax (409) 740-4717 Email Address: leszek@tamu.edu leszek@hawaii.edu
3. Affiliation (Institution/Agency/Organization)  Texas A&M University at Galveston Department of Marine Biology Institute of Marine Life Sciences	For graduate students, Major Professor's Name & Telephone  N/A
4. Sub-Permittee/Assistant Names, Affiliations, and Contact Information <input checked="" type="checkbox"/> CV or resume attached  Cynthia Vanderlip ( <i>Co-Investigator</i> ) DLNR/DOFAW 2135 Makiki Height Dr Honolulu, HI 96822  Tadamichi Morisaka ( <i>Post-Doctoral Researcher</i> ) Laboratory of Ethology, Graduate School of Science, Kyoto University Kitashirakawa-oiwake, Sakyo, Kyoto 606-8502, Japan	
5. Project Title Population Ecology of Spinner Dolphins in Far-Western Hawaii: Long-Term Monitoring Program	
6. Applicant Signature  Leszek Karczmarski ( <i>signed electronically</i> )	7. Date (mm/dd/yyyy)  04/15/2006

<b>Section B: Project Information</b>
<b>8. (a) Project Location</b>  <input checked="" type="checkbox"/> NWHI State Marine Refuge (0-3 miles) waters surrounding: <ul style="list-style-type: none"> <li><input type="checkbox"/> Nihoa Island</li> <li><input type="checkbox"/> Necker Island (Mokumanamana)</li> <li><input type="checkbox"/> French Frigate Shoals</li> <li><input type="checkbox"/> Laysan</li> <li><input type="checkbox"/> Maro</li> <li><input type="checkbox"/> Gardner Pinnacles</li> <li><input type="checkbox"/> Lisianski Island, Neva Shoal</li> <li><input type="checkbox"/> Pearl and Hermes Atoll</li> <li><input checked="" type="checkbox"/> Kure Atoll, State Wildlife Refuge</li> <li><input type="checkbox"/> Other NWHI location</li> </ul> Describe project location (include names, GPS coordinates, habitats, depths and attach maps, etc. as appropriate).  Kure Atoll lagoon



**(b) check all actions to be authorized:**

- ☐ Enter the NWHI Marine Refuge waters
- ☐ Take (harvest)                      ☐ Possess                      ☐ Transport (☐ Inter-island    ☐ Out-of-state)
- ☐ Catch                                      ☐ Kill                                      ☐ Disturb                      ☒ Observe
- ☒ Anchor                                      ☒ Land (go ashore)                      ☐ Archaeological research
- ☐ Interactions with Sea Turtles or Monk Seals                      ☐ Interactions with Seabirds
- ☐ Interactions with Live Coral, Ark Shells or Pearl Oysters
- ☐ Interactions with Jacks, Grouper or Sharks
- ☐ Conduct Native Hawaiian religious and/or cultural activities
- ☒ Other activities: Continue long-term research project monitoring population ecology of spinner dolphins at Kure Atoll

**(c) Collection of specimens – collecting activities (would apply to any activity):** N/A

**Organisms or objects (List of species, if applicable, add additional sheets if necessary):** N/A

Common name	Scientific name	No. & size of specimens	Collection Location(s)
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N/A

**(d) What will be done with the specimens after the project has ended?**

N/A

**(e) Will the organisms be kept alive after collection?**                      ☐ yes                      ☐ no

- Specific site/location \_\_\_\_\_
- Is it an open or closed system?                      ☐ open                      ☐ closed
- Is there an outfall?                      ☐ yes                      ☐ no
- Will these organisms be housed with other organisms? If so, what are the other organisms?

N/A

**(Please attach additional documentation as needed to complete the questions listed below)**

**9. Purpose/Need/Scope:**

- State purpose of proposed activities:

Spinner dolphins (*Stenella longirostris*) are distributed throughout the Hawaiian Archipelago. They are regularly seen at all of the Main Hawaiian Islands, but only four locations in the Northwestern Hawaiian Islands: Kure Atoll, Midway Atoll, Pearl & Hermes Reef, and French Frigate Shoals. Our research has shown that spinner dolphins in the NWHI differ from spinner dolphins in the Main Hawaiian Islands in terms of behavior, social structure, population size, population genetic structure, and genetic diversity. In particular, spinner dolphins in the NWHI show more stable social groups, much smaller population sizes, and lower genetic diversity. These characteristics likely make spinner dolphins in the NWHI more vulnerable to environmental change, whether natural or human-induced. For example, a disease outbreak or an increase in tiger shark populations could have severe effects on these populations. The purpose of the proposed activities is to monitor the spinner dolphin population and provide baseline data on population size, inter-island movement patterns, residence rate, genetic stock structure, genetic diversity, social structure, patterns of behavior, and habitat use patterns. These data will aid in management by helping to identify current or potential threats to the population.

Describe how your proposed activities will help provide information or resources to fulfill the State Marine Refuge purpose and to reach the Refuge goals and objectives.

The proposed activities promote the refuge's goals of long-term conservation of one of its marine species, the Hawaiian spinner dolphin. This project provides baseline data on population size, inter-island movement patterns, residence rate, genetic stock structure, genetic diversity, social structure, pattern of behavior, and habitat use patterns. Furthermore, since our project is a continuation of previous work, it provides long-term data which is important for the accurate assessment of the population dynamics of long-lived animals. These data will aid in management by helping to identify current or potential threats to the population; for instance, unusual mortality events caused by disease outbreaks would go unnoticed if baseline information on population structure and ecology is not known. Furthermore, documenting daily patterns of behavior (e.g. activity level as measured by acoustic sampling) and preferred habitat usage within the lagoon (as measured by direct boat follows) helps managers to identify 'off limits areas' for other small boats working within the atoll, and information that can be applied also in many other atoll locations.

- Give reasons why this activity must take place in the NWHI and cannot take place in the Main Hawaiian Islands, or elsewhere.

Spinner dolphins in the NWHI differ from spinner dolphins in the Main Hawaiian Islands in terms of behavior, social structure, population size, population genetic structure, and genetic diversity. In particular, spinner dolphins in the NWHI show more stable social groups, much smaller population sizes, and lower genetic diversity. These characteristics likely make spinner dolphins in the NWHI more vulnerable to environmental change. Therefore, data on spinner dolphins in the Main Hawaiian Islands would not provide the information most relevant to the conservation of spinner dolphins in the NWHI.

- Describe context of this activity, include history of the science for these questions and background.

Our research on spinner dolphins in the NWHI began in 1998 at Midway Atoll and gradually evolved into multifaceted research that employs a broad array of research techniques over the entire Hawaiian Archipelago. The research also involves a diverse range of expertise ranging from behavioral ecology, mark-recapture analyses of social structure and population modeling, to molecular analyses of genetic structure, stock structure assessment, and biochemical approaches to feeding ecology through fatty acid and stable isotope signature analyses. This research involves several inter-institutional collaborations, including Texas A&M University (Leszek Karczmarski), Mote Marine Laboratory (Leszek Karczmarski and Randall Wells), Hawaii DLNR (Cynthia Vanderlip), University of Hawaii (Kim Andrews, Brian Bowen, Rob Toonen), University of Central Florida (Graham Worthy), and University of Zurich, Switzerland (Michael Krützen). Beginning with the 2006 field season, we will incorporate passive acoustic research in collaboration with Tadamichi Morisaka (Kyoto University). Although our research to date has begun to answer our initial research questions regarding spinner dolphins in the NWHI, longer-term data are required to fully understand the population dynamics of these animals.

- Explain the need for this activity and how it will help to enhance survival or recovery of refuge wildlife and habitats.

Our research has shown that spinner dolphins in the NWHI show stable social groups, small population sizes, and low genetic diversity. These characteristics likely make spinner dolphins in the NWHI vulnerable to environmental change, whether natural or human-induced. The purpose of the proposed activities is to monitor the spinner dolphin population and provide baseline data on population size, inter-island movement patterns, residence rate and daily activity pattern, genetic stock structure, genetic diversity, behavioral variability, social structure, and habitat use patterns. These data will aid in management by helping to identify current or potential threats to the population.

- Describe how your proposed project can help to better manage the State Marine Refuge.

By furnishing base-line population data for a key delphinid species of the region, this work complements several other conservation and/or management projects (e.g. coral habitat mapping, ichthyofauna assessment, etc.) that are currently taking place. Jointly with these other current and forthcoming research efforts, our work provides a significant contribution to the development of conservation measures that can effectively guide long-term management planning of the Northwestern Hawaiian Islands State Marine Refuge.

#### 10. Procedures (include equipment/materials)

Individual Photo-Identification surveys will be conducted using a small outboard motor boat, and following a standard boat-survey protocol (Würsig & Jefferson 1990) and a data collection protocol used effectively in our studies of spinner dolphins in NWHI to date (e.g. Karczmarski et al. 2005). Dolphins will be photographed using a Canon 1D digital camera equipped with a variable length (zoom 100-400 mm) image-stabilized lens. Each photographic image will be stored onto a 2

GB Compact Flash media card with a 40 GB Mindstor media device for backup and storage of images in the field. Individuals will subsequently be identified following standard laboratory procedures (Karczmarski & Cockcroft 1998), and the computer-assisted individual-identification package "Stenella" (G. Gailey & L. Karczmarski, unpublished) will be used to assist with processing images and data management. Each image will be assessed on the bases of image quality and the distinctiveness of an individual, to minimize unequal catchability related biases (following Karczmarski et al. 2005), and only the highest quality photographic images of distinctive individuals will furnish the ID-catalogue.

Genetic Sampling will utilize the Paxarms.745 biopsy system, a modified rifle that can effectively deliver miniature biopsy darts with cutting heads 6 mm wide and 8 mm long, to a distance of 15 m (Krützen et al. 2002). Samples will be taken from about 10-15 cm below or behind the dorsal fin. Each sample will be preserved in a salt-saturated solution of 20% dimethyl sulphoxide (DMSO; Amos & Hoelzel 1991) and stored at room temperature. All efforts will be taken to ensure the confirmation of the identity of all sampled individuals, with one biopsy sample collected per each individually recognizable dolphin, and the anticipated total number of samples not exceeding 100.

Biopsy sampling is a standard procedure for collecting genetic samples from cetaceans. Behavioral responses to biopsy sampling have been monitored and reported in a number of cetacean species, including humpback whales (Brown et al. 1994; Weinrich et al. 1991; Clapham & Matilla 1993), north Atlantic right whales (Brown et al. 1991), gray whales (Matthews 1986), sperm whales (Whitehead et al. 1990), bottlenose dolphins (Weller et al. 1997, Hohn, IWC 1991), other relative to spinner dolphin *Stenella* species (Hohn, IWC 1991), striped dolphins, common dolphins, bottlenose dolphins, and Risso's dolphins (Aguilar, IWC 1991). In all cases, behavioural responses were considered unlikely to have any significant impact on the cetaceans. A study of wound healing of surgical biopsies in bottlenose dolphins found that all wounds were covered by epidermis at least 42 days after biopsy with no indication of infection (Weller et al. 1997). After reviewing behavioral response data from numerous biopsy sampling studies, the International Whaling Commission (1991) concluded that any short-term or long-term negative effects of biopsy darting on individual cetaceans or cetacean populations are unlikely. They commented that cetaceans in the wild commonly experience and recover from cookie-cutter shark bites, killer whale tooth rakes, and intraspecific aggression, all of which are more severe than a wound from biopsy sampling.

We have used biopsy sampling in our research for four years and have collected over 300 spinner dolphin biopsies across the Hawaiian Archipelago. At Kure Atoll in 2003, we collected 34 biopsy samples from spinner dolphins over the period of 7 weeks. During this time period, we were able to monitor wound healing, and we observed normal/healthy wound healing. Subsequent field seasons (2004 and 2005) at Kure Atoll showed no observable change in population size, behavior, or apparent health.

All biopsy samples will be collected by L. Karczmarski, who has over 15-years of field experience with cetaceans and other marine mammals in diverse range of habitats that include coastal regions of South Africa, Mozambique, Tanzania, Kenya, Madagascar, and Belize, semipelagic regions of the Maldives, Bahamas, Cook Islands, Zanzibar, and Hawaii, and the tropical rain forest of the Peruvian Amazon. He has extensive experience with using Paxarms biopsy system (and other genetic sampling techniques), and has used this technique (jointly with K. Andrews and C. Vanderlip) to collect biopsy samples from spinner dolphins in all four Hawaiian atolls since 2001, as well as other delphinid species elsewhere (dwarf spinner dolphins and bottlenose dolphins off East Africa, humpback dolphins in Mozambique, and bottlenose dolphins in Belize).

All laboratory work and subsequent analyses will be conducted by Dr. Michael Krützen (University of Zurich) and Kim Andrews (Hawaii Institute of Marine Biology). M. Krützen is one of the world's leading experts in delphinid socio-genetics and population genetics, and has conducted detailed study of population genetics of bottlenose dolphins in Shark's Bay, Australia. He contributed to the design of the Paxarms biopsy system, and pioneered several of the analytical approaches that will be applied in our project. K. Andrews is currently completing her Ph.D. project through University of Hawaii. She has several years of field and laboratory experience with delphinid population genetics, including dusky dolphins in New Zealand and spinner dolphins in Hawaii. Her past years of research in Hawaii render her a leading expertise in spinner dolphin population genetics. Currently nearing completion, her work on the barriers to gene flow in the Hawaiian spinner dolphin that covers the entire Hawaiian Archipelago is likely to represent a bench mark in mammalian population genetic studies, both marine and terrestrial (for further information, see attached her institution-approved Ph.D. thesis proposal).

Acoustic sampling (*sensu* Morisaka et al. 2005a, 2005b) will be performed with a stationary hydrophone array (3-4 hydrophones) set up at Kure Atoll at a location frequently used by spinner dolphins for resting. During the dolphin presence, behavioral data will be recorded through visual observations. Data from the recording device will be downloaded onto a PC after each recording session. As a back up to the stationary hydrophone array, similar data can be collected using linearly-towed hydrophone array. Acoustic monitoring of the entry and exit of the atoll will be done with custom made acoustic buoys placed in proximity of the entry/exit location (2 buoys placed at approximately 50-meter interval). Recording will be done continually from late afternoon to the next morning, after which the data will be downloaded to a computer.

Based on the work cited above, the expertise of all involved researchers, and our previous experience with Hawaiian spinner dolphins at all locations across Hawaii where spinner dolphins occur (including extensive experience with the Kure Atoll population), we anticipate no impact on the spinner dolphin population due to photographic identification, biopsy sampling, or acoustic sampling.

11. Funding sources (attach copies budget & funding sources).

The core expenses of the fieldwork are covered by L. Karczmarski's personal money. Facility support at Kure Atoll is provided by DLNR/DOFAW. Subsequent lab expenses for *a*) photo-identification mark-recapture analyses and population modeling will be covered by L. Karczmarski's research support through Texas A&M University and Texas Institute of Oceanography, *b*) genetic analyses by M. Krützen through his research support at the University of Zurich and K. Andrews at Hawaii Institute of Marine Biology, and *c*) acoustic analyses by T. Morisaka through his fellowship from Kyoto University and Japanese Society for the Promotion of Science.

12. List all literature cited in this application as well as all other publications relevant to the proposed project.

Literature Cited:

Amos, W., Hoelzel, A.R. (1991). Long term preservation of whale skin for DNA analysis. Reports of the International Whaling Commission (Special Issue 13): 99-104.

Andrews, K., Karczmarski, L., Au, W.W.L., Rickards, S., Vanderlip, C.A., Toonen, R.J. (2006). Patterns of genetic diversity in the Hawaiian spinner dolphin (*Stenella longirostris*). Atoll Research Bulletin 543: xxx-xxx (in press).

Brown, M.R., P.J. Corkeron, P.T. Hale, K.W. Schultz, and M.M. Bryden. 1994. Behavioral responses of East Australian humpback whales *Megaptera novaeangliae* to biopsy sampling. Marine Mammal Science 10(4): 391-400.

Brown, M.W., S.D. Kraus, D.E. Gaskin. 1991. Reaction of north Atlantic right whales (*Eubalaena glacialis*) to skin biopsy sampling for genetic and pollutant analysis. Reports of the International Whaling Commission (Special Issue 13) pp. 81-89.

Clapham, P.J. and D.K. Matilla. 1993. Reactions of humpback whales to skin biopsy sampling on West Indies breeding ground. Marine Mammal Science 9: 382-391.

IWC. 1991. Report of the Scientific Committee. Reports of the International Whaling Commission 41: 51-219.

Karczmarski, L. & Cockcroft, V.G. (1998). Matrix photo-identification technique applied in studies of free-ranging bottlenose and humpback dolphins. Aquatic Mammals 24: 143-147.

Karczmarski, L., Würsig, B., Gailey, G.A., Larson, K.W., Vanderlip, C. (2005). Spinner dolphins in a remote Hawaiian atoll: social grouping and population structure. Behavioral Ecology 16: 675-685.

Krützen, M., Barre, L.M., Möller, L.M., Heithaus, M.R., Simms, C., Sherwin, W.B. (2002). A biopsy system for small cetaceans: darting success and wound healing in Tursiops spp. Marine Mammal Science 18: 863-878.

Matthews, E.A. 1986. Multiple uses of skin biopsies collected from free-ranging gray whales (*Eschrichtius robustus*): sex chromatin analysis, collection and processing for cell culture, microbiological analysis of associated microorganisms, behavioral response of whales to biopsying, and future prospects for using biopsies in genetic and biochemical studies. M.Sc. thesis, University of California, Santa Cruz.

Morisaka, T., Shinohara, M., Nakahara, F., Akamatsu, T. (2005a) Geographic variations in the whistles among three Indo-Pacific bottlenose dolphin *Tursiops aduncus* populations in Japan. Fishery Science 71: 568 – 576.

Morisaka, T., Shinohara, M., Nakahara, F., Akamatsu, T. (2005b) Effects of ambient noise on the whistles of Indo-Pacific bottlenose dolphin populations. Journal of Mammalogy, 86(3): 541 – 546.

Norris, K.S., Würsig, B., Wells, R.S., Würsig, M., Brownlee, S.M., Johnson, C.M., Solow, J. (1994). The Hawaiian spinner dolphin. Berkeley: University of California Press.

Weinrich, M.T., R.H. Lambertsen, C.S. Baker, M.R. Schilling, and C.R. Belt. 1991. Behavioural responses of humpback whales (*Megaptera novaeangliae*) in the southern Gulf of Maine to biopsy sampling. Reports of the International Whaling Commission (Special Issue 13) pp. 91-97.

Weller, D.W., V.G. Cockcroft, B. Würsig, S.K. Lynn, and D. Fertl. 1997. Behavioral responses of bottlenose dolphins to remote biopsy sampling and observations of surgical biopsy wound healing. Aquatic Mammals 23.1:49-58.

Whitehead, H. (1999a). Testing association patterns of social animals. Animal Behavior 57: F26-F29.

Whitehead, H. (1999b). Socprog 1.2 (for Matlab 5.1): programs for analysing social structure. Halifax, Nova Scotia, Canada, Dalhousie University.

Whitehead, H., J. Gordon, E.A. Mathews, K.R. Richard. 1990. Obtaining skin samples from living sperm whales. Marine Mammal Science 6(4): 316-326.

Würsig, B., Jefferson, T.A. (1990). Methods of photo-identification for small cetaceans. Rep. Int. Whal. Commn (Special Issue 12): 43-52.

*Project Publications Relevant to This Application:*

*Published Peer-Reviewed Papers*

Karczmarski, L., B. Würsig, G. Gailey, K.W. Larson, and C. Vanderlip (2005). Spinner dolphins in a remote Hawaiian atoll: social grouping and population structure. *Behavioral Ecology* 16: 675-685.

Andrews, K. (2004). Barriers to gene flow in the Hawaiian spinner dolphin (*Stenella longirostris*). *Pacific Science* 58(1): 119-120 (abstract).

*In Press*

Andrews, K.R., Karczmarski, L., Au, W.W.L., Rickards, S.H., Vanderlip, C.A., and Toonen, R.J. (2006). Patterns of genetic diversity of the Hawaiian spinner dolphin (*Stenella longirostris*). *Atoll Research Bulletin* 543 (In Press).

*In Preparation (final stage, to be submitted in 2-3 months)*

Karczmarski, L., Rickards, S., Gowans, S., Würsig, B. & Vanderlip, C. Intra-group dynamics of an insular spinner dolphin population in far-western Hawai'i. *Proceedings of the Royal Society of London, Series B: Biological Sciences*.

Karczmarski, L., Rickards, S. & Vanderlip, C. How much fission-fusion is there? Social structure of an insular spinner dolphin population. In preparation for *Animal Behaviour*.

*Contributions to Workshops and Symposia*

Karczmarski, L., Rickards, S.H., Gowans, S., Andrews, K.R., Würsig, B. & Vanderlip, C. (2005). 'One for all and all for one': Intra-group dynamics of an insular spinner dolphin population. In: Abstracts, Sixteenth Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA, USA.

Andrews, K.R., Karczmarski, L., Bowen, B.W., Rickards, S.H., Au, W.W.L., Vanderlip, C. & Toonen, R.J. (2005). Intraspecific variability in gene flow corresponds with social systems and environment for the Hawaiian spinner dolphin (*Stenella longirostris*). In: Abstracts, Sixteenth Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA, USA.

Karczmarski, L. (2005). Insular spinner dolphin populations in remote atolls of the far-western Hawaiian Archipelago. Invited talk. In Abstracts: Ninth International Mammalogical Congress (IMC 9), 31 July - 5 August 2005, Symposium: Insularity and Its Effects, 2 August 2005, Sapporo, Japan.

Karczmarski, L. & Wells, R.S. (2005). Social behavior and social evolution in delphinids. Ninth International Mammalogical Congress (IMC 9), 31 July - 5 August 2005, Symposium: 'Delphinid and Primate Social Ecology: A Comparative Overview', 1 August 2005, Sapporo, Japan.

Karczmarski, L., Andrews, K.R. & Rickards, S.H. (2005). Social dynamics of insular delphinid population: The spinner dolphin model. 'Delphinid and Primate Social Ecology: A Comparative Discussion', an international conference at Kyoto University, 28 - 30 July 2005, Kyoto, Japan.

Andrews, K.R. & Karczmarski, L. (2005). Ecological barriers to gene flow in the Hawaiian spinner dolphin. *Evolution 2005 Conference*. American Society of Naturalists, Society for the Study of Evolution, and Society of Systematic Biologists; University of Alaska Fairbanks, 10 - 14 June 2005, Fairbanks, Alaska, USA.

Andrews, K.R. & Karczmarski, L. (2005). Ecological and behavioral factors influencing patterns of interbreeding and genetic diversity in the Hawaiian spinner dolphin. *Pacific Science, Albert L. Tester Memorial Symposium*, University of Hawaii, 16-18 March 2005, Honolulu, HI, USA.

Karczmarski, L., Rickards, S., Würsig, B., Vanderlip, C. & Andrews, K.R. (2004). Population structure and connectivity of spinner dolphins in the northwestern Hawaiian atolls. In: Abstracts, Third Northwestern Hawaiian Islands Science Symposium, 2-4 November 2004, Honolulu, HI, USA.

Andrews, K., Au, W.W.L., Karczmarski, L., Rickards, S. & Vanderlip, C. (2004). Population assessment of the Hawaiian spinner dolphin (*Stenella longirostris*) through genetic analysis. In: Abstracts, Third Northwestern Hawaiian Islands Science Symposium, 2-4 November 2004, Honolulu, HI, USA.

Karczmarski, L., Rickards, S., Würsig, B., Vanderlip, C., Gowans, S. & Andrews, K.R. (2003). How much fission-fusion is there? – Social structure of an insular spinner dolphin population. In: Abstracts, Fifteenth Biennial Conference on the Biology of Marine Mammals, 14-19 December 2003, Greensboro, NC, USA.

Andrews, K.R., Au, W.W.L., Karczmarski, L., Rickards, S. & Vanderlip, C. (2003). Barriers to gene flow in the Hawaiian spinner dolphin (*Stenella longirostris*). In: Abstracts, Fifteenth Biennial Conference on the Biology of Marine Mammals, 14-19 December 2003, Greensboro, NC, USA.

Karczmarski, L. & Andrews, K.R. (2003). Spinner dolphin research in the Northwestern Hawaiian Islands. First Northwestern Hawaiian Islands Science Workshop: Information Needs for Conservation and Management, 13 – 15 May 2003, Honolulu, Hawaii, USA.

13. What types of insurance do you have in place? (attach documentation)

- ☐ Wreck Removal  
☐ Pollution

14. What certifications/inspections do you have scheduled for your vessel? (attach documentation)

- ☒ Rat free      ☒ tender vessel      ☒ gear/equipment  
☒ Hull inspection      ☐ ballast water N/A

DLNR vessels:

Vessel 1: 17' Twin Vee Power Cat vessel with 25 hp 4-stroke Yamaha engine, and a 4-stroke 9.9 Honda engine.

Vessel 2: 10' Apex inflatable with a 4-stroke 15 hp Honda engine.

Before departure, both vessels are washed, fumigated and inspected for alien terrestrial and aquatic species.

All gear is soaked in 100% fresh water for 24 hours. Care is taken to open all pockets and zippered compartments before soaking in fresh water. Life vests, cushions and lines are washed and frozen for 48 hours.

15. Other permits (list and attach documentation of all other required Federal or State permits).

L. Karczmarski holds NMFS Scientific Research Permit No. 1007-1629-01 (valid through August 2006), which is currently being extended through August 2007. C. Vanderlip and K. Andrews are Co-Investigators on the abovementioned permit, and T. Morisaka will be included as Co-Investigator under that permit beginning with the 2006 field season.

16. Project's relationship to other research projects within the NWHI State Marine Refuge, National Wildlife Refuge, NWHI Coral Reef Ecosystem Reserve, or elsewhere.

This long-term project is conducted in co-operation with NWHI Coral Reef Ecosystem Reserve (contact person: Dr. Randall Kosaki), the U.S. Fish and Wildlife Service (contact person: Dr. Beth Flint), and is supported (in-kind facility support) by DLNR/DOFAW.

### Section C: Logistics

17. Time Frame: May 8 through September

Project Start Date

May 8

Project Completion Date

September

Dates actively inside the State Marine Refuge.

May 10 through September

Personnel schedule in the State Marine Refuge (describe who will be where and when).

Cynthia Vanderlip will be at Kure Atoll from May 13 through September. Leszek Karczmarski and Tadamichi Morisaka will be at Kure from the mid-July through September.

18. Gear and Materials

- ☐ Dive equipment      ☐ Radio Isotopes  
☐ Collecting Equipment      ☐ Chemicals (specify types)

Photographic gear, Paxarms.745 biopsy system, stationary hydrophone and linearly-towed hydrophone array.

19. Fixed installations and instrumentation.	
<input type="checkbox"/> Transect markers	<input checked="" type="checkbox"/> Acoustic receivers
<input type="checkbox"/> Other (specify) _____	
20. Provide a time line for sample analysis, data analysis, write-up and publication of information.	
<p>Data analysis and publication is ongoing, as indicated above. The photo-ID data collected during this study will be included into larger population analyses publications intended for <i>Marine Ecology Progress Series</i>, <i>Ecological Applications</i>, and <i>Journal of Applied Ecology</i>, with first drafts scheduled for the last quarter of 2007. The new genetic and acoustic data will require a minimum of 2-year sampling effort (2006 and 2007); data analyses will follow immediately, and publications within approximately 14-16 months.</p>	
21. <b>Vessel Information:</b>	
Vessel Name: Sette and the Hi'ialakai	IMO Number _____
Vessel Owner _____	Flag _____
Captain's Name _____	Chief Scientist or Project Leader _____
Vessel Type _____	Call sign _____
Length _____	Gross tonnage _____
Port of Embarkation _____	
Last port vessel will have been at prior to this embarkation _____	
Total Ballast Water Capacity: Volume _____ m3	Total number of tanks on ship _____
Total Fuel Capacity: _____	Total number of fuel tanks on ship _____
Other fuel/chemicals to be carried on board and amounts: _____	
Number of tenders/skiffs aboard and specific type of motors: _____	
Does the vessel have the capability to hold sewage and grey-water? Describe in detail. _____	
Does the vessel have a night-time light protocol for use in the NWHI? Describe in detail (attach additional pages as necessary) _____	
On what workboats (tenders) will personnel, gear and materials be transported within the State Marine Refuge? _____	
How will personnel, gear and materials be transported between ship and shore? _____	
If applicable, how will personnel be transported between islands within any one atoll? _____	

**Additional Information:**

*Other Project Participants (involved in data analyses but not participating in the field work at Kure Atoll)*

Kimberly R. Andrews (Co-Investigator, Ph.D. Candidate)

Hawaii Institute of Marine Biology, University of Hawaii, 46-007 Lilipuna Rd, Kaneohe, HI 96744

Dr. Michael Krützen (Collaborator)

Anthropological Institute and Museum, University of Zurich, Winterthurerstr. 190, CH-8057 Zurich, Switzerland



## **Texas A&M University at Galveston**

Institute of Marine Life Sciences  
Behavioral Ecology Laboratory  
4700 Avenue U, Building 303  
Galveston, TX 77551, USA

Dr. Leszek Karczmarski  
Tel: 409-740-4718  
Fax: 409-740-4717  
karczmal@tamug.edu

Athline M. Clark  
Special Projects Program Manager  
Hawaii Division of Aquatic Resources  
Department of Land and Natural Resources  
1151 Punchbowl St. Rm. 330  
Honolulu, Hawaii 96813

15 April 2006

Dear Ms Clark,

Please find attached my application for conducting a field research at Kure Atoll during the period May through September 2006. Accompanying this application is my Curriculum vitae and other supporting documents listed below (note that all attachments are PDF files created with Acrobat Pro 7.0, and require Acrobat Reader 7.0 or higher). Also, please note that my current NMFS Scientific Research Permit No. 1007-1629-01 (valid through August 2006) is currently being extended through August 2007. Approval has been granted, and I have requested the Permit Division representative to send (e-mail) you a note confirming our permit status; you should receive it shortly.

If there are any further questions, please contact me at the e-mail address above (with CC to: leszek@hawaii.edu). However, note that I am currently in travel in South Africa and so please allow a moderate delay in my replies.

Sincerely,

*signed electronically*

Leszek Karczmarski, Ph.D.  
Associate Research Professor: Marine Biology

CC: L. Karczmarski's permit application  
Curriculum vitae of L. Karczmarski  
Curriculum vitae of T. Morisaka  
Ph.D. Thesis proposal of K. Andrews (approved by University of Hawaii)



# Leszek Karczmarski, Ph.D.

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## *Curriculum vitae*

Institute of Marine Life Sciences, Texas A&M University, 4700 Avenue U, Building 303, Galveston, TX 77551, USA  
Tel: (409) 740-4718 Fax: (409) 740-4717 E-mail: karczmal@tamug.edu and leszek@hawaii.edu

## PERSONAL DETAILS

*Nationality:* Polish

*Languages:* Polish and English

## ACADEMIC RECORD

**Post-Doctoral Research 2.** Fellow of the Texas Institute of Oceanography, Texas A&M University, USA (August 2000 – July 2003).

**Post-Doctoral Research 1.** Marine Mammal Research Program, Texas A&M University at Galveston, USA (January 1998 – June 2000).

**Ph.D.** in Zoology. University of Port Elizabeth, South Africa (February 1991 – April 1997). Degree conferred on 19 April 1997.

**M.Sc.** in Oceanography and Sea Fisheries. University of Gdańsk and Agricultural University of Szczecin, Poland (October 1983 – October 1989). Degree conferred on 12 October 1989.

## CURRENT ACADEMIC POSITION

**Associate Research Professor**, Institute of Marine Life Sciences, Texas A&M University, Galveston, Texas, USA

**Research Faculty**, Mammal Research Institute, University of Pretoria, Whale Unit: Cape Town, South Africa

## INTERNATIONAL RECOGNITION

**Senior Visiting Scholar**, Kyoto University and Japan Society for the Promotion of Science, Japan (2006)

**Senior Research Fellow**, Mammal Research Institute, University of Pretoria, South Africa (2005)

## ACADEMIC AND RESEARCH COLLABORATION/AFFILIATION

Mote Marine Laboratory, Sarasota, Florida, USA -- Research Scientist (Adjunct)

University of Hawai'i at Hilo, Department of Marine Sciences, Hawai'i, USA -- Visiting Lecturer

Department of Land and Natural Resources, Division of Forestry and Wildlife, State of Hawai'i, USA -- Research Collaborator

Hugh Parkey Foundation for Marine Awareness and Education, Belize -- Science Advisor and Research Collaborator

Universidade Eduardo Mondlane, Museu de História Natural, Maputo, Mozambique -- Science Advisor

## CURRENT RESEARCH

### *Field Research*

1. **Social ecology of spinner dolphins *Stenella longirostris* in the remote atolls of far-western Hawai'i.** Research topics include: a) population structure and connectivity, b) social strategies, c) group dynamics and patterns of fission-fusion, d) spatial and temporal movements, e) population social structure relative to environmental pressures, f) effects of insularity, g) comparisons with other known mammalian systems, and h) management implications.
2. **Genetic structure of Hawaiian spinner dolphins.** A collaborative research project, conducted jointly with K.R. Andrews (University of Hawai'i) investigating patterns of gene flow between spinner dolphin groups across the Hawaiian island chain; variation within populations and divergence between populations relative to varied degrees of geographic insularity.

3. **Feeding ecology of Hawaiian spinner dolphins;** collaboration with G.A.J. Worthy (University of Central Florida). Fatty acid signature analysis and stable isotopic signature analysis are used to investigate feeding ecology of spinner dolphins in various habitats of the Hawaiian Archipelago, and compared to the pelagic form of spinner dolphins from the Eastern Tropical Pacific.
4. **Spinner dolphins of equatorial East Africa: population ecology and taxonomic status.** Research project conducted in the Pemba Channel region, northern Zanzibar Archipelago, Tanzania, and off south Kenya coast. Taxonomic status investigated in collaboration with W.F. Perrin and R. Leduc of the Scripps Institution of Oceanography and NOAA Southwest Fisheries Science Center.
5. **Conservation status of dugongs *Dugong dugon* in Bazaruto Archipelago, Mozambique** (the likely last biologically-viable population of dugongs in East Africa), conducted jointly with A.T. Guissamulo, Museu de História Natural, Universidade Eduardo Mondlane. Research involves population assessment through aerial surveys, and habitat mapping. Conservation of dugongs is promoted as part of long-term management planning for the Bazaruto Marine National Park.
6. **Conservation ecology of Indo-Pacific humpback dolphins *Sousa chinensis* and bottlenose dolphins *Tursiops aduncus* in southern Mozambique,** conducted jointly with A.T. Guissamulo. Research topics include: a) population size, structure, residence rates, b) spatial and temporal movement patterns, c) group dynamics, and d) habitat relationships.
7. **Population ecology of bottlenose dolphins *Tursiops truncatus* in the Belize barrier reef lagoon system.** A new project, initiated in mid-2005, conducted in the Drowned Cayes area, central Belize; investigating population parameters, group structure, genetic relationships, and management status (in collaboration with C. Self-Sullivan of Hugh Parkey Foundation).

#### **Other Projects**

1. **Delphinid and primate comparative social ecology,** a collaborative project with J. Yamagiwa of Kyoto University. Two international meetings, a conference at Kyoto University (28-30 July 2005) and a symposium at the Ninth International Mammalogical Congress (IMC 9), Sapporo, Japan (1 August 2005), drew together international expertise in the fields of primate and delphinid behavioral ecology. An edited, multi-author volume, *Social ecology of dolphins, monkeys and apes: A comparative overview*, currently in preparation for the University of Chicago Press, will provide a synthesis of the current state of knowledge of social ecology and social evolution in primates and delphinids (edited by L. Karczmarski and J. Yamagiwa, intended date of going to press: mid 2007).
2. **Database management system for photo-identification of free-ranging cetaceans.** A collaborative project with G.A. Gailey of Texas A&M University and R.S. Wells of Mote Marine Laboratory, developing a database system that will interface with computer-assisted individual identification programs, and will assist with the standardization of field data collection, data management, and mark-recapture analyses.
3. **Curriculum development for marine education and environmental outreach in Belize.** Member of a Strategic Planning Committee, Spanish Bay Conservation and Research Center, Hugh Parkey Foundation for Marine Awareness and Education, Belize.

#### **PREVIOUS POSITIONS AND PROFESSIONAL EXPERIENCE**

##### **Post-Doctoral Researcher**

August 2000 – July 2003

*Texas Institute of Oceanography, Texas A&M University, Galveston, TX, USA*

Principal researcher and collaborator in several studies that led to the current scope of ongoing research:

1. Social ecology and population structure of spinner dolphins in three remote atolls (Kure, Midway, and Pearl & Hermes) in far-western Hawai'i.
2. Genetic structure and management status of spinner dolphins across the Hawaiian island chain (in collaboration with K.R. Andrews, HIMB, University of Hawai'i, USA).
3. Occurrence and distribution of spinner dolphins across the atoll chain of the Maldives, Indian Ocean (in collaboration with Marine Research Centre, Malé, Republic of Maldives).
4. Occurrence and distribution of spinner dolphins in Cook Islands, South Pacific (in collaboration with Cook Islands Natural Heritage Program, Rarotonga, The Cook Islands).
5. Group dynamics of a small bottlenose dolphin community off the Texas coast; advisor (analytical techniques) to three graduate research projects.
6. Conservation status and ecology of dugongs and humpback dolphins in central-southern Mozambique (in collaboration with Universidade Eduardo Mondlane, Maputo, Mozambique).

**Visiting Scientist**

March – May 2000

*River Dolphins of Peru Research Project, Iquitos, Peru*

Member of a research team that investigated abundance, habitat preferences, season patterns, and current conservation status of boto *Inia geoffrensis* and tucuxi *Sotalia fluviatilis* in the upper Amazon, Pacaya-Samiria National Reserve, Peru.

**Principal Research Scientist**

February 1998 – January 2000

*Midway Atoll Spinner Dolphin Research Project, Oceanic Society, San Francisco, USA*

Investigated population parameters, structure, ecology, social dynamics, and patterns of behavior of spinner dolphins at Midway Atoll, far-western Hawai'i. Responsible for the research design and implementation, data analyses, supervision of students and adult participants. Collaborated with U.S. Fish and Wildlife Service personnel of the Midway Atoll National Wildlife Refuge in establishing conservation measures for the Midway Atoll resident spinner dolphin population.

**Research Advisor**

January – February 1999

*Belize Marine Conservation Research Project, Oceanic Society, San Francisco, USA*

Guided two graduate projects investigating patterns of occurrence, distribution, movement, and habitat use of Atlantic bottlenose dolphins and Antillean manatees *Trichechus manatus manatus* in Drowned Cayes, Belize, Central America.

**Research Advisor**

June 1995 – December 1997

*Museu de História Natural, Universidade Eduardo Mondlane, Maputo, Mozambique*

Provided guidelines (research design and data analyses), and participated in all aspects of ecological studies of Indo-Pacific bottlenose and humpback dolphins in Maputo Bay, Mozambique. Research objectives included assessment of population parameters and fishery interactions.

**Contract Scientist**

March – June 1997

*Madagascar Coastal Zone Research Expedition, WWF International*

Member of a team assessing the ecological status of marine resources along the west coast of Madagascar:

1. Assessment of the occurrence, diversity, and subsistence harvest of marine mammals and sea turtles,
2. Assessment of the status of coral reefs and sea-grass beds.

**Research Scientist**

February 1991 – February 1997

*Centre for Dolphin Studies, Port Elizabeth Museum, South Africa***Ph.D. Student***Department of Zoology, University of Port Elizabeth, South Africa*

Principal Researcher in two field research projects:

1. Ecological studies of Indo-Pacific humpback dolphins. Doctoral research project that investigated population parameters, group dynamics, habitat preferences, movement, range, seasonal patterns, and diurnal behavior of humpback dolphins in the Algoa Bay region, Eastern Cape province, South Africa. Conservation and management recommendations were formulated for this species in the southern African region.
2. Ecological studies of Indo-Pacific bottlenose dolphins. The study examined the occurrence and movement patterns, habitat use, group dynamics, behavior, population figures and seasonal dynamics of bottlenose dolphins along the south Eastern Cape coast of South Africa.

**Researcher**

June – July and October – November 1994

*Western Indian Ocean Dugong Research Project, Port Elizabeth Museum, South Africa*

Member of a team assessing the abundance and distribution of dugongs along the central and south coast of Mozambique, ecological status of the coastal zone, and levels of human impact on the dugong population.

**OTHER RESEARCH EXPERIENCE****Scientific Consultant**

December 1995

*Kenyan Wildlife Service, Lamu, Kenya*

Member of a team assessing feasibility of a conservation program focused on dugongs and inshore dolphin species in the lagoon system of Lamu, northern Kenya.

**Environmental Consultant**

June – July 1995

*City Engineer's Department, Port Elizabeth Municipality, South Africa*

Assessed ecological impacts of commercial development of the Port Elizabeth beachfront on two inshore dolphin species (humpback and bottlenose). Collaborated with town planners and city engineers in Port Elizabeth on the beachfront development plan.

**Graduate Research Fellow**

February – August 1987 and April 1988 – February 1989

*Netherlands Institute for Sea Research, Texel, The Netherlands*

1. Graduate Student investigating the impact of predator pressure on growth, mortality and reproduction of the lugworm *Arenicola marina* in the Dutch Wadden Sea (M.Sc. research project).
2. Research Assistant examining population dynamics and early postnatal growth of eiderducks *Somateria mollissima* in the Dutch Wadden Sea.
3. Research Assistant investigating food competition in deposit- and suspension-feeding bivalves.

**TEACHING EXPERIENCE****Visiting Lecturer**

Summer session (June-July) 2004

*Department of Marine Sciences, University of Hawaii at Hilo, Hawaii, USA*

Designed the syllabus and taught at the UH campus at Hilo, Hawaii:

1. Biology of Marine Mammals (3 credits)
2. Marine Mammal Research Techniques (2 credits)

**Principal Lecturer**

July – August 1999

*Atlantic Spotted Dolphin Project, Oceanic Society, Bahamas*

Conducted introductory field-based classes in marine mammal biology and tropical marine ecology. Supervised undergraduate projects in underwater behavior of Atlantic spotted dolphins *Stenella frontalis* at the Little Bahama Bank, the Bahamas.

**Associate Junior Lecturer**

March 1995 – October 1996

*University of Port Elizabeth, South Africa*

Co-taught two undergraduate seminar courses:

1. Behavioral Ecology
2. Conservation Biology

**Associate Lecturer**

April 1994 – September 1997

*Port Elizabeth Technical University, South Africa*

Initiated, designed the syllabus, compiled student-booklets for, and conducted three junior-level courses:

3. Introduction to Physical and Biological Oceanography
4. Marine Biodiversity
5. Natural History of Marine Mammals

**OTHER EXPERIENCE**

Safari tour leader - southern Africa (1994 – 1997)

SCUBA diver certification (NAUI Openwater-1, February 1992 and Openwater-2, March 1992)

Sport vessel skipper license (Department of Transportation, Eastern Cape, South Africa, 1991)

Free-lance environmental journalist (Poland, 1988 – 1990)

**INVITED PARTICIPATION IN WORKSHOPS AND SYMPOSIA**

Insular spinner dolphin populations in the remote atolls of the far-western Hawaiian Archipelago. *Invited paper* at Symposium S-22: Insularity and its Effects (2 August 2005), at the Ninth International Mammalogical Congress (IMC 9), 31 July - 5 August 2005, Sapporo, Japan.

Delphinid and Primate Social Ecology: A Comparative Overview. *Co-Organizer*, jointly with J. Yamagiwa of Kyoto University, Symposium S-03 (1 August 2005) at the Ninth International Mammalogical Congress (IMC 9), 31 July - 5 August 2005, Sapporo, Japan.

Delphinid and Primate Social Ecology: A Comparative Discussion. *Co-Organizer*, jointly with J. Yamagiwa of Kyoto University, International Conference at Kyoto University, 28 - 30 July 2005, Kyoto, Japan.

Conservation of coastal marine mammals in developing countries: Involvement of local communities. *Invited paper* at the Seventh SAGA Symposium (SAGA 7: Support for Asian and African Great Apes), Symposium: Environmental Education and Conservation, 12-14 November 2004, Kyoto, Japan.

Northwestern Hawaiian Islands Science Workshop: Information Needs for Conservation and Management. *Invited Participant*. National Oceanic and Atmospheric Administration, National Ocean Service, National Marine Sanctuary Program, 13 - 15 May 2003, Honolulu, Hawaii, USA.

A review of the current status of the genus *Sousa* (humpback dolphins). *Invited Panelist*. The 54<sup>th</sup> meeting of the Scientific Committee of the International Whaling Commission (IWC), Sub-Committee for Small Cetaceans, 29 April - 5 May 2002, Shimonoseki, Japan.

Integrating Marine Conservation in the Indian Ocean: 1996 and Beyond. *Invited participant*. The First Workshop of the Indian Ocean Conservation Program (Indian Ocean Marine Affairs Cooperation, Fauna International and New England Aquarium), 28 November - 1 December 1995, Mombasa, Kenya.

## INVITED PEER REVIEWER

### Journals:

Marine Ecology Progress Series, Marine Biology, Journal of Zoology (London), Canadian Journal of Zoology, Australian Journal of Zoology, Mammalian Species, Behavioural Ecology and Sociobiology, Animal Behaviour, Biological Conservation, Conservation Biology, Animal Conservation, Journal of Mammalogy, Marine Mammal Science, Aquatic Mammals, Journal of Cetacean Research and Management, South African Journal of Zoology, South African Journal of Wildlife Management, Endangered Wildlife, Brazilian Journal of Biology, Mammalian Biology, Journal of the Marine Biological Association, Journal of Applied Ecology, Environmental Management.

### Books:

Skinner, J. & Smithers, (2005). *The Mammals of the Southern African Subregion*. Struik, Cape Town.

Folkens, P.A., Reeves, R.R., Stewart, B.S., Clapham, P.J. & Powell, J.A. (2002). *Guide to Marine Mammals of the World*. National Audubon Society; A.A. Knopf Publishers, New York.

### Research Foundations:

The U.S. National Science Foundation, Harbor Branch Oceanographic Institution, National Geographic Society, National Fish and Wildlife Foundation, Sirenian International, Earthwatch Institute

## PUBLICATIONS (28 March 2006)

### Dissertations/Thesis:

**Karczmarski, L.** (1996). Ecological studies of humpback dolphins *Sousa chinensis* in the Algoa Bay region, Eastern Cape, South Africa. *Ph.D. dissertation*, University of Port Elizabeth.

**Karczmarski, L.** (1989). Impact of predator pressure on growth, mortality and reproduction of the lugworm *Arenicola marina* in the Wadden Sea. *M.Sc. thesis* (in Polish), Akademia Rolnicza w Szczecinie.

**Books:**In Preparation

**Karczmarski, L.** & Yamagiwa, J. (eds). Social ecology of dolphins, monkeys and apes: A comparative overview. Intended publisher: *University of Chicago Press*, anticipated date of going to press: mid 2007.

**Peer Reviewed Papers:**In Press

Andrews, K., **Karczmarski, L.**, Au, W.W.L., Rickards, S., Vanderlip, C.A., Toonen, R.J. (2006). Patterns of genetic diversity in the Hawaiian spinner dolphin (*Stenella longirostris*). *Atoll Research Bulletin* 543: 000-000.

Gowans, S., Würsig, B. & **Karczmarski, L.** (2006). Delphinid social strategies: An ecological approach. *Advances in Marine Biology* 00: 000-000.

Published

**Karczmarski, L.**, Würsig, B., Gailey, G.A., Larson, K.W., Vanderlip, C. (2005). Spinner dolphins in a remote Hawaiian atoll: social grouping and population structure. *Behavioral Ecology* 16: 675-685.

Jefferson, T.A. & **Karczmarski, L.** (2001). *Sousa chinensis*. *Mammalian Species* 655: 1-9.

**Karczmarski, L.** (2000). Conservation and management of humpback dolphins: the South African perspective. *Oryx* 34: 207-216.

**Karczmarski, L.**, Cockcroft, V.G. & McLachlan, A. (2000). Habitat use and preferences of Indo-Pacific humpback dolphins *Sousa chinensis* in Algoa Bay, South Africa. *Marine Mammal Science* 16: 65-79.

**Karczmarski, L.**, Thornton, M. & Cockcroft, V.G. (2000). Daylight occurrence of humpback dolphins *Sousa chinensis* in Algoa Bay, South Africa. *African Journal of Ecology* 38: 86-90.

**Karczmarski, L.** (1999). Group dynamics of humpback dolphins *Sousa chinensis* in the Algoa Bay region, South Africa. *Journal of Zoology, London* 249: 283-293.

**Karczmarski, L.**, & Cockcroft, V.G. (1999). Daylight behaviour of Humpback dolphins *Sousa chinensis* in Algoa Bay, South Africa. *Mammalian Biology (Zeitschrift für Säugetierkunde)* 64: 19-29.

**Karczmarski, L.**, Cockcroft, V.G. & McLachlan, A. (1999). Group size and seasonal pattern of occurrence of humpback dolphins *Sousa chinensis* in Algoa Bay, South Africa. *South African Journal of marine Science* 21: 89-97.

**Karczmarski, L.**, Winter, P.E.D., Cockcroft, V.G. & McLachlan, A. (1999). Population analyses of Indo-Pacific humpback dolphins *Sousa chinensis* in Algoa Bay, Eastern Cape, South Africa. *Marine Mammal Science* 15: 1115-1123.

**Karczmarski, L.** & Cockcroft, V.G. (1998). Matrix photo-identification technique applied in studies of free-ranging bottlenose and humpback dolphins. *Aquatic Mammals* 24: 143-147.

**Karczmarski, L.**, Cockcroft, V.G., McLachlan, A. & Winter, P.E.D. (1998). Recommendations for the conservation and management of humpback dolphins *Sousa chinensis* in the Algoa Bay region, South Africa. *Koedoe* 41: 121-129.

**Karczmarski, L.**, Thornton, M. & Cockcroft, V.G. (1997). Description of selected behaviours of humpback dolphins *Sousa chinensis*. *Aquatic Mammals* 23: 127-133.

Kamermans, P., Veer van der, H.W., **Karczmarski, L.** & Doeglas, G.H. (1992). Competition in deposit- and suspension-feeding bivalves: experiments in controlled outdoor environments. *Journal of Experimental Marine Biology and Ecology* 162: 113-135.

Bergman, M.J.N., Veer van der, H.W. & **Karczmarski, L.** (1988). Impact of tail-nipping on growth, mortality and reproduction of *Arenicola marina*. *Netherlands Journal of Sea Research* 22: 83-90.

#### In Preparation

*To be submitted by mid 2006:*

**Karczmarski, L.**, Rickards, S., Gowans, S., Würsig, B. & Vanderlip, C. Intra-group dynamics of an insular spinner dolphin population in far-western Hawai'i. *Proceedings of the Royal Society of London, Series B: Biological Sciences*.

**Karczmarski, L.**, Rickards, S. & Vanderlip, C. How much fission-fusion is there? – Social structure of an insular spinner dolphin population. In preparation for *Animal Behaviour*.

Andrews, K.R., **Karczmarski, L.**, Bowen, B.W., Rickards, S.H., Au, W.W.L., Vanderlip, C. & Toonen, R.J. Intraspecific variability in gene flow corresponds with social systems and environment for the Hawaiian spinner dolphin (*Stenella longirostris*). In preparation for *Molecular Ecology*.

*Other:*

**Karczmarski, L.**, Rickards, S. & Vanderlip, C. Population dynamics of spinner dolphins in a remote Hawaiian atoll. In preparation for *Ecological Applications*.

**Karczmarski, L.**, Rickards, S., Würsig, B., Vanderlip, C. & Ross, G.L. Patterns of behavior of spinner dolphins *Stenella longirostris* at Midway Atoll. In preparation for *Journal of Mammalogy*.

**Karczmarski, L.**, Rickards, S. & Vanderlip, C. How closed are spinner dolphin populations in remote atolls of the far-western Hawaii. In preparation for *Marine Ecology Progress Series*.

#### *Unpublished Reports:*

**Karczmarski, L.** (2005). Ecology and socio-economy of sustainable dolphin-watch tourism at Pemba Island, Zanzibar Archipelago, East Africa: Implications for coastal management, conservation, community involvement, and sustainable development. Technical Report to the Government of Zanzibar.

**Karczmarski, L.** (2005). Conservation by design: The science and practice of protecting inshore delphinids in East Africa. Report to the Conservation Fund.

**Karczmarski, L.** (2003). Dynamics of spinner dolphin societies: A multi-habitat approach. Report to the National Geographic Society.

**Karczmarski, L.** (1999). Ecological studies of Hawaiian spinner dolphins *Stenella longirostris* at Midway Atoll, Northwestern Hawaii. Report to the US National Marine Fisheries Service and US Fish & Wildlife Service.

**Karczmarski, L.** & Cockcroft, V.G. (1994). Natural history of bottlenose and humpback dolphins from the Eastern Cape, South Africa. Final research report (project ZA 314) to the Foundation for Research Development (FRD) South Africa.

#### *Conference Contributions:*

**Karczmarski, L.**, Rickards, S.H., Gowans, S., Andrews, K.R., Würsig, B. & Vanderlip, C. (2005). 'One for all and all for one': Intra-group dynamics of an insular spinner dolphin population. In: Abstracts, Sixteenth Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego,

CA, USA.

Andrews, K.R., **Karczmarski, L.**, Bowen, B.W., Rickards, S.H., Au, W.W.L., Vanderlip, C. & Toonen, R.J. (2005). Intraspecific variability in gene flow corresponds with social systems and environment for the Hawaiian spinner dolphin (*Stenella longirostris*). In: Abstracts, Sixteenth Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA, USA.

Maze-Foley, K., Irwin, L.J., Henderson, E.E., Würsig, B. & **Karczmarski, L.** (2005). Bottlenose dolphins (*Tursiops truncatus*) in San Luis Pass, Texas: A small but dynamic community. In: Abstracts, Sixteenth Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA, USA.

**Karczmarski, L.** (2005). Insular spinner dolphin populations in remote atolls of the far-western Hawaiian Archipelago. Ninth International Mammalogical Congress (IMC 9), 31 July - 5 August 2005, Symposium S-22: Insularity and its Effects, 2 August 2005, Sapporo, Japan.

**Karczmarski, L.**, Wells, R.S., Gowans, S. & Würsig, B. (2005). Social behavior and social evolution in delphinids. Ninth International Mammalogical Congress (IMC 9), 31 July - 5 August 2005, Symposium S-03: 'Delphinid and Primate Social Ecology: A Comparative Overview', 1 August 2005, Sapporo, Japan.

Yamagiwa, J. & **Karczmarski, L.** (2005). Socioecological perspectives in primates and delphinids. Ninth International Mammalogical Congress (IMC 9), 31 July - 5 August 2005, Symposium S-03: 'Delphinid and Primate Social Ecology: A Comparative Overview', 1 August 2005, Sapporo, Japan.

**Karczmarski, L.**, Andrews, K.R. & Rickards, S.H. (2005). Social dynamics of insular delphinid population: The spinner dolphin model. 'Delphinid and Primate Social Ecology: A Comparative Discussion', conference at Kyoto University, 28 - 30 July 2005, Kyoto, Japan.

Maze-Foley, K., **Karczmarski, L.**, Irwin, L.J., Henderson, E.E. & Würsig, B. (2005). Group dynamics of a small bottlenose community off the Texas coast. 'Delphinid and Primate Social Ecology: A Comparative Discussion', conference at Kyoto University, 28 - 30 July 2005, Kyoto, Japan.

Andrews, K.R. & **Karczmarski, L.** (2005). Ecological barriers to gene flow in the Hawaiian spinner dolphin. 'Evolution 2005 Conference'; American Society of Naturalists, Society for the Study of Evolution, and Society of Systematic Biologists; University of Alaska Fairbanks, 10-14 June 2005, Fairbanks, AK, USA.

Andrews, K.R. & **Karczmarski, L.** (2005). Ecological and behavioral factors influencing patterns of interbreeding and genetic diversity in the Hawaiian spinner dolphin. Pacific Science, Albert L. Tester Memorial Symposium, University of Hawaii, 16-18 March 2005, Honolulu, HI, USA.

**Karczmarski, L.**, Self-Sullivan, C. & Würsig, B. (2004). Conservation of coastal marine mammals in developing countries: Involvement of local communities. In: Abstracts, Seventh SAGA Symposium (SAGA 7: Support for Asian and African Great Apes), 12-14 November 2004, Kyoto, Japan.

**Karczmarski, L.**, Rickards, S., Würsig, B., Vanderlip, C. & Andrews, K. (2004). Population structure and connectivity of spinner dolphins in the northwestern Hawaiian atolls. In: Abstracts, Third Northwestern Hawaiian Islands Science Symposium, 2-4 November 2004, Honolulu, HI, USA.

Andrews, K.R., Au, W.W.L., **Karczmarski, L.**, Rickards, S. & Vanderlip, C. (2004). Population assessment of the Hawaiian spinner dolphin (*Stenella longirostris*) through genetic analysis. In: Abstracts, Third Northwestern Hawaiian Islands Science Symposium, 2-4 November 2004, Honolulu, HI, USA.

**Karczmarski, L.**, Rickards, S., Würsig, B., Vanderlip, C., Gowans, S. & Andrews, K.R. (2003). How much fission-fusion is there? – Social structure of an insular spinner dolphin population. In: Abstracts, Fifteenth Biennial Conference on the Biology of Marine Mammals, 14-19 December 2003, Greensboro,



NC, USA.

- Andrews, K.R., Au, W.W.L., **Karczmarski, L.**, Rickards, S. & Vanderlip, C. (2003). Barriers to gene flow in the Hawaiian spinner dolphin (*Stenella longirostris*). In: Abstracts, Fifteenth Biennial Conference on the Biology of Marine Mammals, 14-19 December 2003, Greensboro, NC, USA.
- Karczmarski, L.** & Andrews, K.R. (2003). Spinner dolphin research and management in the Northwestern Hawaiian Islands. First Northwestern Hawaiian Islands Science Workshop: Information Needs for Conservation and Management, 13 - 15 May 2003, Honolulu, HI, USA.
- Karczmarski, L.**, Andrews, K.R. & Würsig, B. (2002). Behavioral ecology of insular spinner dolphin population: Implications for conservation and management of the northwest Hawaiian region. In: Abstracts, Carnivores 2002: Fourth Biennial Conference on Carnivore Biology and Conservation, 17 - 20 November 2002, Monterey, California, USA.
- Karczmarski, L.** (2002). Population ecology of humpback dolphins in South Africa: implications for conservation and management. Working document SC/549/SM14, Scientific Committee of the International Whaling Commission, 54th IWC meeting, 26 April - 24 May 2002, Shimonoseki, Japan.
- Karczmarski, L.**, Guissamulo, A.T. & Cockcroft, V.G. (2002). Bazaruto Archipelago: an area of high importance in humpback dolphin and dugong conservation. Working document SC/549/SM15, Scientific Committee of the International Whaling Commission, 54th IWC meeting, 26 April - 24 May 2002, Shimonoseki, Japan.
- Karczmarski, L.**, Würsig, B., Rickards, S., Gailey, G.A., Vanderlip, C. & Larson, K. (2001). Spinner dolphins in a remote atoll habitat: Ecological bases of social dynamics. In: Abstracts, Fourteenth Biennial Conference on the Biology of Marine Mammals, 28 November - 3 December 2001, Vancouver, Canada.
- Karczmarski, L.**, Würsig, B. & Gailey, G.A. (2000). Social behaviour of insular delphinid population: the spinner dolphin model. Animal Social Complexity and Intelligence: a Multi-Disciplinary Comparative Discussion, The Chicago Academy of Sciences, 23 - 26 August 2000, Chicago, Illinois, USA.
- Karczmarski, L.**, Würsig, B. & Vanderlip, C. (1999). The spinners of Midway: Socio-ecology of *Stenella longirostris* in an isolated atoll environment. In: Abstracts, Thirteen Biennial Conference on the Biology of Marine Mammals, 28 November - 3 December 1999, Maui, Hawaii.
- Karczmarski, L.** & Cockcroft, V.G. (1997). Socio-ecology and population biology of humpback dolphins (*Sousa chinensis*) in the Algoa Bay region, South Africa: an overview. Working document SC/49/SM23, Scientific Committee of the International Whaling Commission, 49th IWC meeting, 29 September - 11 October 1997, Bournemouth, U.K.
- Cockcroft, V.G., Vely, M., Rakotonirina, B.P., Young, D.D. & **Karczmarski, L.** (1997). Marine mammals of Madagascar (and the Comoros Is.) and their exploitation. Working document SC/49/SH18, Scientific Committee of the International Whaling Commission, 49th IWC meeting, 29 September - 11 October 1997, Bournemouth, U.K.
- Karczmarski, L.** & Cockcroft, V.G. (1995). Ecological studies of inshore dolphins in the Algoa Bay region, Eastern Cape, South Africa. First Workshop of the Indian Ocean Conservation Program, 28 November - 1 December 1995, Mombassa, Kenya.
- Karczmarski, L.** & Cockcroft, V.G. (1995). Dynamics of humpback dolphin *Sousa chinensis* groups: evidence for resident and migratory stocks in the Algoa Bay region, Eastern Cape, South Africa. In: Abstracts, Eleventh Biennial Conference on the Biology of Marine Mammals, 14 - 18 December 1995, Orlando, Florida, USA.

- Karczmarski, L. & Cockcroft, V.G. (1995).** Evidence for resident and migratory stocks of humpback dolphins *Sousa chinensis* in Algoa Bay. In: Abstracts, Joint Symposium of the Zoological Society of Southern Africa and Southern African Society of Aquatic Scientists, 27 - 30 June 1995, Rhodes University, Grahamstown, South Africa.
- Karczmarski, L. (1995).** Cetacean occurrence pattern in the Algoa Bay Region: a possibility for education and ecotourism. In: Proceedings, Conference of Pan African Association of Zoological Gardens, Aquaria and Botanical Gardens, 7 - 9 June 1995, Port Elizabeth, South Africa.
- Karczmarski, L. & Cockcroft, V.G. (1993).** Ecology and behaviour of humpback dolphins *Sousa chinensis* of the Eastern Cape, South Africa. In: Abstracts, Tenth Biennial Conference on the Biology of Marine Mammals, 11 - 15 November 1993, Galveston, Texas, USA.
- Karczmarski, L. & Cockcroft, V.G. (1993).** Movement and habitat utilization by humpback dolphins *Sousa chinensis* in the Eastern Cape waters, South Africa. In: Abstracts, Eight Triennial Southern African Marine Science Symposium, 17 - 22 October 1993, Club Mykonos, Langebaan, South Africa.
- Karczmarski, L., Cockcroft, V.G. & Ralfe, M. (1993).** Feeding techniques in bottlenose dolphins. In: Abstracts, Eight Triennial Southern African Marine Science Symposium, 17 - 22 October 1993, Club Mykonos, Langebaan, South Africa.
- Karczmarski, L., Durham, B.D. & Cockcroft, V.G. (1991).** Individual recognition of humpback dolphins. In: Abstracts, Ninth Biennial Conference on the Biology of Marine Mammals, 5 - 9 December 1991, Chicago, Illinois, USA.

#### **Popular Articles:**

- Cockcroft, V.G. & **Karczmarski, L. (1997).** Can dolphins benefit from conservation zones in South Africa? *Custos* November '97: 12-14.
- Karczmarski, L. (1997).** In search of dolphins. *Custos* May '97: 24-26.
- Karczmarski, L. (1997).** Powerboats: are they a dolphin's friend or foe? *Power Boat and Ski* February '97: 44-45, 52.
- Karczmarski, L. (1996).** The dolphins of Algoa Bay. *Endangered Wildlife* 24, September '96: 4-7.
- Karczmarski, L. & Cockcroft, V.G. (1993).** Dolphin research on the south-eastern African coast. *Wszechswiat* 94, April '93: 88-91 (in Polish).
- Karczmarski, L. (1993).** A few words on endangered cetacean species. *Problemy* 557, January '93: 35-38 (in Polish).
- Karczmarski, L. (1992).** Whales and dolphins. *Przyroda Polska* 431, November '92: 12-13 (in Polish).
- Cockcroft, V.G. & **Karczmarski, L. (1992).** Inshore marine mammals - animals in imminent danger. *Wszechswiat* 93, September '92: 220-222 (in Polish).
- Karczmarski, L. (1992).** Dolphin's misfortune. *Morze* 731, January '92: 22-23 (in Polish).
- Karczmarski, L. & Cockcroft, V.G. (1992).** Will dolphins of the South African coast survive to the next century? *Problemy* 545, January '92: 26-30 (in Polish).
- Karczmarski, L. & Peddemors, V.M. (1991).** Dangerous or endangered: controversy with shark nets in South Africa. *Problemy* 543/544, November/December '91: 36-40 (in Polish).
- Karczmarski, L. (1991).** The fascinating cetaceans. *Wszechswiat* 92, October '91: 209-216 (in Polish).
- Karczmarski, L. (1990).** Reproduction of seals in a polluted environment. *Problemy* 530, October '90: 29-

31 (in Polish).

**Karczmarski, L.** (1990). Lugworms of the Wadden Sea. *Wszechswiat* 91, July/August '90: 133-135 (in Polish).

**Karczmarski, L.** (1990). Wadden - the sea of the tide. *Morze* 708, January '90: 22-23 (in Polish).

**Karczmarski, L.** (1989). Eiderducks from the Wadden Sea. *Wszechswiat* 90, June '89: 125-128 (in Polish).

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